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BRIEFS

YOUR GRACE, PERIOD. Instrument-rated pilots who began training for a multi-engine rating after October 1, 1984 will have to demonstrate instrument proficiency in a multi-engine aircraft. Otherwise they can only be issued a M.E. rating restricted to VFR flight. Those who show evidence of starting the training before the deadline and who apply for the flight test prior to December 1, 1984, will be exempted from this new requirement. The grace period was granted by FAA to avoid any confusion between pilot examiners and the public.

INTERNAL COMBUSTION. Flight through the atmosphere is evidently not the only source of static electricity buildup in aircraft. Recently in Canada an explosion and fire destroyed an airplane during a clean-out of fuel lines in a closed hangar. Apparently the movement of dust particles, driven by a heater blower over the aircraft, induced an electric charge, releasing a spark. Grounding hangared aircraft is a good safety precaution, because of possible fumes from fuel residue.

ICE IN YOUR BREATHER. Before the cold weather really strikes, operators of PA-28 aircraft are encouraged to insulate the oil breather tube against possible inflight freeze-up (and subsequent oil starvation). High-time engines, in particular, are known to pass moisture (via piston blowby) into the oil breather, which can lead to icing. Piper Service Letter 845 covers this subject.

HORSE BEFORE THE CART. Exterior finishes of helicopters may not be designed in such a manner as to restrict the size of N-number markings below the minimum dimensions (12" - or as large as practicable on the largest authorized surface). The numbers and letters must read horizontally, not vertically, and they may not be angled or placed on fuselage surfaces where they could be covered by doors that are opened in flight.

CHOPPER CHARRING. The U.S. Forest Service has experimented with burning slash on clear-cut logged areas, as a means of promoting early regrowth. During recent trial operations in the Okanagan, WA, National Forest, burning was accomplished over 54 acres by means of a special torch fueled with a mixture of aluminum and gasoline, and attached to a Forest Service helicopter.

The Internal Barometer

A warm body can be just as sensitive to pressure changes as cold metal

Every pilot owns a personal sensitive barometer which he probably never sees, although it is activated every time he flys in an aircraft. This instrument is known medically as the "middle ear," a small, air-filled cavity within the bone of the skull and separated from the external ear by the ear drum membrane. It is capable of sensing altitude changes of 100 feet or less. In fact, it is not uncommon for some people to have their ears "pop" simply as a consequence of riding in a rapid elevator in a tall building.

This popping sensation, which is perfectly normal, signals a transference of air bubbles between the middle ear and the (eustachian) tubes which lead to the throat. In order for the hearing process to function, the air pressure inside the ear must be maintained very close to the ambient air pressure. This is accomplished by a release of air through the eustachian tubes, during a climb, and an input of air, via the same channels, during a descent. This equalization of pressure normally takes place automatically, and is aided by the act of swallowing or yawning. As all pilots know, flying is unwise when you have a cold, sinus infection or allergy—or any ailment which produces congestion in the upper respiratory system, since the congestion may interfere with the flow of air to the middle ear. This can lead to all kinds of distress, from a feeling of ear blockage to temporary loss of hearing, or acute pain—or even to rupture of the eardrum in exceptionally severe cases of "barotitis".

Many pilots do not realize how sensitive this internal barometer is. Some of us assume that if the aircraft is pressurized there will be no problem flying with a slight case of sniffles. We overlook the fact that pressurization within an aircraft is always proportional—not equal—to the outside pressure. At 20,000′ MSL the air pressure in a pressurized cabin may be anywhere from 6,000′ to 8,000′. The change in ambient air pressure is most noticeable during a steep climbout or descent—particularly during the descent, when a partial vacuum may be created within the middle ear as a result of clogged air passages.

Another common mistaken assumption is that a flight at low altitude will not affect your ears, even though you have a slight cold. The onset of pain may occur immediately after takeoff and it could very well interfere with your ability to give full attention to controlling the aircraft. In some cases the inner ear may also be affected. Since this cavity contains the semi-circular canals which control our sense of balance, disorientation could follow.

The use of decongestant medicine, such as antihistamines, taken internally by active pilots is never recommended, since they could cause drowsiness or lack of alertness to flight problems. However, the occasional use of nasal sprays which have an astringent, or shrinking, effect on swollen tissues in the nasal passages are considered all right for pilots with no known health problems.

Pilots who become aware of cold symptoms only after initiating a flight should consider returning to their home base, or landing as soon as practical. Temporary relief from ear pains during the descent may be obtained by deliberately swallowing (or yawning), since the act of swallowing forces air toward the middle ear.

In more severe cases pilots are advised to carry out what is known as the "Valsalva maneuver," which consists of closing the mouth, pinching the nose shut, and forcing air toward the ears by squeezing in the cheek muscles. Preferably this should be done in the presence of a co-pilot.

As the pressure differential between the ear and the outside air increases, there is a critical point beyond which none of these methods for clearing the Eustachian tubes will work. Therefore it is important to ventilate blocked ears frequently during a descent, even if this requires a rather shallow descent angle of approach, or breaking off a descent and flying at level altitude temporarily.

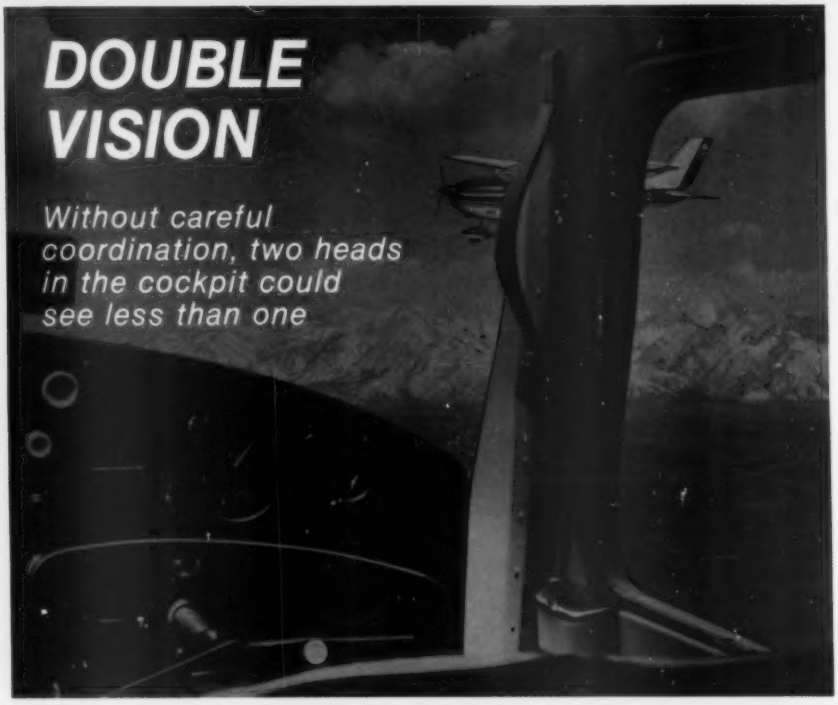
Incidentally, to a lesser extent the sinus cavities in the head are also susceptible to painful symptoms as a result of air being trapped by swollen tissues, during changes in altitude. "Barosinusitus" pain is most noticeable in the forehead. Since the small sinus openings cannot be controlled by the individual in any way, relief from severe inflight pain may only be obtained by delaying descent, or even by reascending.

It is not unusual for barotitis or sinusitus pain to continue for some time after landing. However, if pain or loss of hearing persists for several days, a physician specialist should be consulted, to make certain that the ears have not been damaged or infected.

As with most sensitive instruments, reasonable care can avoid expensive maintenance. If you start to cough, stay on the ground. ■

DOUBLE VISION

Without careful coordination, two heads in the cockpit could see less than one



Two pair of eyes can see more than one—right? Not always. At least, as far as cockpit vigilance for conflicting air traffic is concerned, the accident data does not indicate that two persons sitting up front are more successful in scanning for other aircraft than one person. As a matter of fact, in recent years nearly half of the midair collisions have involved aircraft with more than one person sitting up front. Even more surprising: about one accident out of four involved an instructor pilot giving instruction.

Most of these accidents take place in the environment of a non-controlled airport in VFR conditions, where the responsibility for safe separation rests entirely with the aircraft crews. Given the professional status of flight instructors, their own concern for survival and their desire to instill safe scanning practices in their students, the question arises: Is there something about the trainee/instructor relationship in flight that contributes to inadequate scanning, and if so, what can be done about it?

Every trainee/instructor relationship has a mixture of child/parent, student/teacher, and even parishioner/priest elements woven in it. To some extent this is good, because it helps the student relax and encourages him to accept direction from a stranger. But neither participant in this relationship should ever forget that each is an adult. The instructor is not infallible and the student must not be irresponsible. They are mutually concerned for the safety of each flight. Any "gray areas" of responsibility should be clearly defined on the ground, before the flight.

The instructor. Regardless of who is actually manipulating the controls of the aircraft, whenever an instructor pilot is on board for the purposes of giving instruction he, or she, is the pilot-in-command (except in certain special circumstances). Every instructor must be concerned with (1) Keeping the aircraft under control, (2) Maintaining a constant scan, and (3) Imparting instruction; *in the above order of priority.* Whenever a midair incident or accident occurs, it is usually the instructor who is cited for failing to keep an adequate lookout—not the student.

This does not mean that the instructor must do all of the scanning, but it does mean he must see that whatever vigilance responsibilities the student is assigned are being discharged effectively. Scanning is often faked or poorly done, by students who are solely concerned with learning a new flying technique, and who assume that the instructor is backing them up with his own scan. Tough-minded instructors find means of puncturing this facade by asking occasional questions about what the student saw in his last glance around the outside of the aircraft. The dialogue usually goes something like this:

(Instructor) "Anything going on back there?"

(Student) *"No, nothing."*

"What did you see?"

"Like I said-nothing. No planes."

"See any clouds?"

"Clouds?"

"Yes, clouds. Those puffy white things they have up here sometimes."

"No, I didn't see any clouds."

"You're sure?"

"Absolutely. Well . . . I don't think so. I'm not dead sure. What difference does it make, anyway?"

"Just wondering. Did you see any birds?"

"Birds? What kind of birds?"

"I don't know. Any kind. Ducks, maybe".

"No, I didn't see any ducks. Why?"

"Sometimes they can be a problem around airports. What did you make of the wind?"

"I did not see any winds, sir."

"Well, you saw that smokestack back there, didn't you? Got to be at least ten knots, from the way it was bending over, wouldn't you agree?"

"I agree."

The purpose is not to heckle the student but to jolt him into realizing he has formed the habit of looking without really seeing. If he is missing items like smoke or birds or clouds because he is anxious to get his eyes back in the cockpit and on the gauges, he could be missing airplanes too. Once he comes to expect your questions he will learn to take his scanning more seriously. Until you are convinced that he does, you will have to back up his observations with your own.

Like the student, the instructor also has a tendency to concentrate on the lesson at hand, which may require monitoring panel instruments, aircraft altitudes, approach aids, etc. If the student is having a problem grasping a procedure or mastering a technique, the instructor may become drawn into the problem to the point where he neglects the scan. He must remind himself of his priorities, and accept the fact that some lessons take longer than others.

He must also guard against donning the mantle of invulnerability or assuming that experience can compensate for vigilance. Experienced pilots have been observed in an airport environment allowing four or five minutes go by without lifting their heads to look out of the cockpit.

That is taking a great deal for granted. Many general aviation aircraft can travel 15 miles in that time, and air carriers twice as far. Tragic accidents have occurred when pilots pre-occupied themselves overlong with technical difficulties during a critical phase of flight. Still rememberd is the highly publicized midnight crash of an L-1011 in the Florida Everglades in 1972, with the loss of 99 lives. All four flight crew members were preoccupied with determining whether the nose wheel was locked in place, and no one noticed that the huge jet was descending instead of holding altitude—despite an aural warning signal.

During training exercises that absorb the instructor's attention completely non-scanned time periods can easily become much larger than any one realizes. Recently a Cessna 172 and a Cessna 152, each with a student and instructor on board, became involved in a midair collision while carrying out flight training in a practice area south of San Jose, CA. The student in the 152 was directed to keep his head inside the cockpit while the instruc-

tor put the airplane in a variety of unusual altitudes, from which the student had to recover by reference to instruments. As the exercise was nearing completion, the instructor observed the 172 on a collision course too late and too close for evasive action. The 152 made a successful emergency landing in an open field, but the *Skyhawk*, which lost portions of the wing from propeller damage, crashed out of control, with two fatalities.

For exercises of this kind to be carried out safely (when the attention of both occupants is required inside the cockpit) great care must be taken to clear the airspace, and to interrupt the maneuvering often enough to search for recent intruders. Veterans flight instructors develop the ability to keep the activities of various other aircraft in mind, much as a skilled chess player keeps in his mind the previous movements and apparent intentions of his opponent, and so avoids being taken by surprise.

Spotting aircraft is not, as some imagine, simply a matter of having "sharp" eyes. In large part it is an acquired ability, made up of practice and experience. Like the neophyte student pilot, who has trouble spotting even a large airport pointed out by his instructor, the newly certificated instructor will simply not pick up distant "targets" or store traffic information as readily as veteran instructors. (Note that simulator time, while valuable for satisfying certificate and currency requirements, does not build or maintain good scanning habits.) Knowing his limitation, the low-time instructor, in the interest of safety, should seek out little used practice areas, if available, or maintain a high ratio of scanning-to-teach time. Caution should be exercised when giving instruction while flying on frequently used routes or near major reporting points, and busy airports.

Instruction should take place, if at all possible, in an aircraft with good all-around visibility and equipped with an altitude encoding transponder as well as with separate com and nav radios in good working order. Frequent use should be made of air traffic advisories wherever available, from ATC centers as well as terminal facilities and also from UNICOM. Although radio transmissions are sometimes distracting to the student, they will get used to them, and if they are going to be flying in busy airspace, that is a necessary part of the learning process.

The nature of an instructional flight should always be made known to ATC facilities and UNICOM operators, so that pilots in the area will be advised and extra care taken against inflight convergence.

One further point, which some instructors overlook: *aircraft familiarity*. If training is to be given in a student's aircraft, with which the instructor is not familiar, allowances must be made for the additional demands this will make on the latter's attention. If you have to read off procedural checklists item by item in flight for your student, and doublecheck his responses, you will have less time for looking around outside the aircraft than you would if the checklist were engraved in your memory and you knew the panel layout like the back of your hand. Take whatever time is necessary to fly the aircraft yourself before you turn it over to a student. Remind yourself occasionally that you are not an Immortal, even though you are wearing wings.

The Student. Every student of flight has been told by his or her instructor at some point to relax—"Just take it easy." That is good advice in an early stage in the game, but flight training eventually reaches the point where deep relaxation can get you into deep trouble. To assume that nothing bad can happen to you as long as this confident, self-assured, officially certificated Instructor Person is sitting next to you is naive, to say the least. The statistics mentioned earlier about instructional involvement in midair collisions are proof to the contrary.

Progressively a student is delegated more and more responsibility for the safety of the flight, as his, or her, skill warrants it. However, if on any occasion the student begins to feel overburdened, or confused, or frightened, those feelings should be communicated to the instructor immediately. Never assume that the instructor knows exactly what is going on in your head. Being human, the instructor occasionally has bad days, days when personal problems nag at his attention and degrade his attentiveness. If a lesson is just not making sense to you, you can always request a return to home base and some time at the chalkboard. If necessary, you can request a switch to another instructor. For successful learning, the student's self-confidence is as important as the instructor's.

In every aircraft there are some scanning areas which are blind spots to the instructor unless he/she is actually flying the airplane. Eventually the student must come to accept responsibility for scanning those areas, in order to maintain safe separation. A midair collision at Camarillo Airport in southern California illustrates the point.

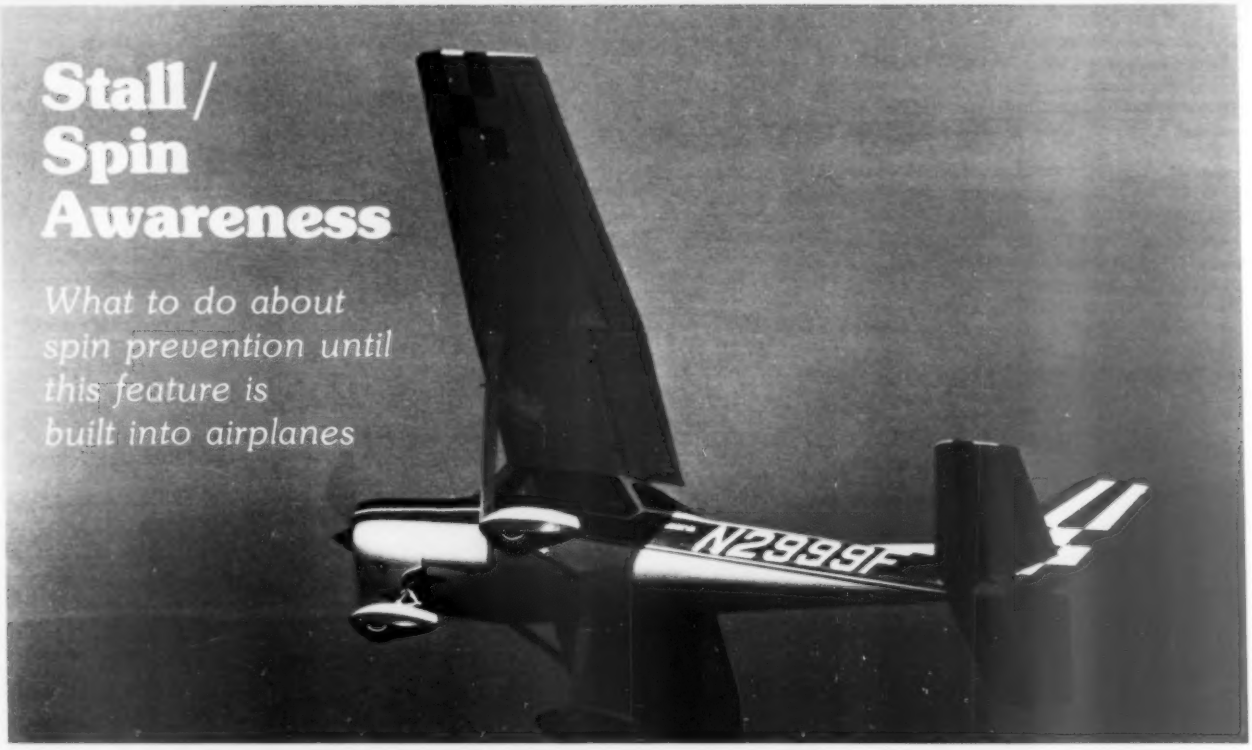
The accident took place at an uncontrolled airport on the coast northwest of Los Angeles, used heavily by training planes from that area. On this afternoon there were half dozen aircraft in the landing pattern, including an Aero Commander *Lark* (single-engine high-wing), and a Grumman AA-1A, a low-wing, canopy covered trainer. The UNICOM frequency was in such continuous use for position reporting that the operator was not responding except for requested radio checks. The *Lark* was occupied by an instructor in the righthand seat and a student, a certificated pilot who was taking refresher training. The Grumman was being flown by a single pilot practicing touch-and-go landings. The pilots of both aircraft stated later that they had filed positions reports downwind, turning base, and turning final, but they were unaware of each other's presence. (The high volume of radio calls may have resulted in blanketing out some of the transmissions.) A lefthand pattern was in progress.

After turning final the crew of the *Lark* heard an excited, garbled transmission and almost immediately became aware that a collision had taken place. Contact had been made, as they discovered later, between the propeller of the Grumman and the tail of the *Lark*. Fortunately both aircraft were able to land on the runway with only minor injuries to the pilots, although the aircraft were substantially damaged.

The official investigation determined, on the basis of statements from witnesses on the ground, that the Grumman trainer's turn onto final had been shorter and steeper than the *Lark's* and "inside" the latter's flight path. Therefore the high-wing plane's crew visibility to the left may have been blocked out by the lowered wingtip in the bank (especially for the instructor). Similarly, for the Grumman pilot the raised right wingtip may have blocked vision to the right and above, during the turn. This high/low wing blindspot occurrence happens frequently, and can only be countered by thorough anticipatory scanning prior to the turn. In heavy traffic the tendency to concentrate on the landing while "scanting the scan" has to be resisted. The presence of an instructor on board who is approving your maneuvers does not mean that he is always able to see out on your side of the airplane. It may just mean that someone is entrusting you with the safety of both lives. ■

Stall/ Spin Awareness

What to do about spin prevention until this feature is built into airplanes



From the earliest days of flying down to the present day, the stall/spin accident has been an everpresent threat to the safety of airmen. As late as the post-World War II period these accidents were still accounting for nearly one-half of all fatal accidents in general aviation aircraft. Improved aircraft design and higher training standards have since reduced that ratio to about one-sixth of all fatal accidents, but that is still a disturbing figure in view of the fact that about 95% of stall/spin mishaps are attributed to pilot error. *Why is safe recovery so difficult?*

In the language of the National Transportation Safety Board, a stall/spin accident is one which:

- Involves loss of control and lift
- Initiates as a stall
- May or may not terminate in a spin.

In other words, all spins start with a stall, of more or less brief duration, but all stalls do not culminate in a spin. In 1981, for example (the latest year for which we have complete figures from the Safety Board) there were 322 stall accidents, of which 117 were fatal. In that same year there were 71 stall/spin accidents, of which 58 were fatal—more than 80 percent.

The unintentional spin accident produces very high fatalities, for several obvious reasons. Many "standard" class aircraft are not required to be tested by the manufacturer in a fully developed spin (more than two complete rotations), and if poor technique is used during recovery, structural disintegration or loss of control may result. Some may progress from a normal spin angle to a steep spin, from which it may not be possible to recover control. The spinning motion may frighten the pilot who has never experienced it before, and could lead to panic and disorientation. And of course the spin may occur too close to the ground for safe recovery in any event.

Since an aircraft cannot spin without first stalling, one of the best ways to avoid the unintentional spin is to develop what is known as "stall awareness." No pilot can be regarded as fully proficient who has not acquired this kind of flight sensitivity. Stall awareness is an unremitting attentiveness to conditions which could bring about loss of control of the aircraft. A numerical knowledge of the stalling speeds of the aircraft in various configurations is also important, but numbers alone are of little help if the eyes are outside the cockpit or the mind is grappling with a technical problem or emergency.

In such circumstances the sense of touch, or feel, or sound can be more informative than the eye. The seat of one's pants is not recommended as a substitute for flight instruments, but it can be a good source of flight information even in the most modern and sophisticated aircraft. Proficient pilots know exactly the kind of pressures they should feel in a properly coordinated turn, for example, and they can sense altitude or lift loss more quickly than some instruments.

The lapse of time between the onset of a stall and its culmination in an unintentional spin can be very brief—at worst only a second or two—depending on the aircraft configuration at the time. Typically the victimized pilot is in a turn at low power and allows one wing or the nose to come up too high. Unless you react *immediately* to the stall warning signals—horn sounding, buffeting, laboring engine, mushy controls, abnormally low airspeed, etc.—you may find yourself in a spin before you know what has happened.

Since stall recovery is practiced most often, in training, from a nose-high attitude, some pilots fail to appreciate the fact that stalls occur at virtually any attitude, including nose-down. A stall will occur *whenever an aircraft exceeds its critical angle of attack for a given airspeed and configuration*. Note that the angle of attack is the *angle between the relative wind and the plane of the wing chord*. The relative wind is primarily determined by the actual flight path of the aircraft, not by its pitch attitude. The latter is defined as the angle between the aircraft nose and the horizon (see diagrams).

Thus it is possible for an aircraft in level flight at cruise power to stall if sufficiently strong turbulence or wind shear is encountered, such as a downdraft, unless corrective action is taken quickly to increase power and reduce the angle of attack. Similarly, an aircraft could stall at high speed when pulling out of a steep descent. The angle of attack could become excessive if the nose is brought up too abruptly.

Departure stalls, which are common, often belong in the category of inadequate preparation. The pilot underestimates his required ground roll distance needed to clear obstacles at the end of the runway, and attempts to compensate by pulling the nose up too sharply during his climbout, or embarks on a turn with inadequate flying speed. If a spin ensues at this low altitude there is no possibility of recovery, even with prior spin training.

There are basic principles of aerodynamics which when properly understood can prevent certain kinds of departure stalls and spins. *Torque* is a case in point. Most U.S. built aircraft engine propellers turn clockwise, as seen from the cockpit. Consequently with a high power setting, as on takeoff, the airplane has a tendency to roll to the left, unless suffucient right *rudder* and aileron applied on liftoff.

"Adverse yaw" is another undesirable phenomenon sometimes seen on departure, particularly in older aircraft. When the pilot banks into a climbing turn at a high angle of attack, following takeoff, the aileron on the lowered wing is deflected up—which reduces the camber and the drag at this wingtip. The relative *increase* in drag on the *up*going wing, with the aileron directed down into the high pressure area, causes the airplane to yaw in the direction of that wing—or opposite to the direction of the turn. Many pilots experience this phenomenon without correctly understanding what is happening. If they add more downwing aileron (instead of countering the yaw with opposite rudder and keeping the ball centered) the yaw increases and airspeed falls off. If the airplane stalls in this configuration, a spin is very likely to follow.

In most modern aircraft the ailerons are rigged to travel farther upward than downward, or are interconnected in a manner which reduces (but does not entirely eliminate) the tendency toward adverse yaw. It is important to remember that the rudder is the most effective flight control for lateral direction at low airspeeds, especially in single engine aircraft where it is located directly in the slipstream.

Departure stalls are also known to occur following retraction of flaps too early—or too rapidly. This again may be linked to insufficient takeoff distance for the existing conditions.

Straight and level. Relatively few stalls take place in level flight at cruise, and even when they do there is generally plenty of altitude for a recovery. But straight and level flight can be deceptive. The wings may be perfectly level, and the fuselage could appear horizontal, but the airplane could still be descending or ascending. Remember that the angle of attack is related to the flight path of the airplane—not the horizon. Monitoring the altimeter and vertical speed indicator can minimize the possibility of a stall during cruise flight.

Landing. According to National Transportation Safety Board statistics, most serious stall/spin accidents are related to the landing phase of flight. This is not only because power is reduced and the altitude is low, but also because in a great many cases the pilot is distracted by some problem with the airplane that had surfaced earlier, such as fuel depletion, power loss, electrical failure, lack of visibility, prevalence of traffic, etc. If your mind becomes entirely concerned with setting the wheels down safely on the ground, you may neglect rudimentary flight tasks such as maintaining proper airspeed, flying a standard pattern or keeping his wings level on final approach. Also, a pilot may get into trouble by trying to stretch a glide beyond the capacity of the airplane—or by steepening a bank or yawing the airplane onto final.

The pilot who is flying a partially disabled aircraft needs to be doubly careful about correct maneuvering and a stabilized approach, since he may not have power available to adjust for errors, or to go around. Where a go-around is appropriate and full power is applied, elevator movement must be controlled carefully to prevent the nose from pitching up, and resulting in an accelerated stall.

As with stall awareness, spin awareness and prevention calls for a quick, alert and correct response. Once it develops, a spin is often a confusing maneuver, with many unpredictable aspects that vary according to make and model, center of gravity and other conditions; but the basic motion and the recovery procedures are fairly standard.

Theoretically a spin can be described as "a rapidly descending maneuver during which the airplane rotates about its vertical axis in corkscrew fashion, with unequally stalled wings." As rotation speed builds up, the flight path becomes nearly vertical. At the completion of the first turn the nose may pitch back up and then pitch down again. By the end of the **third or fourth** turn the spin should be fully developed, as the rolling, pitching and turning motions become repetitive and somewhat stabilized from turn to turn. Airspeed is approximately stall speed, while the descent rate ranges from 3,000′ to 6,000′ per minute in light single-engine airplanes. Stress loads are minimal and not likely to cause damage even to an airplane that is not designed for spinning (although some damage may occur during recovery). The pilot may become dizzy or disoriented, especially if he stares at his whirling wingtips.

Recovery from the spin involves arresting the rotation with rudder, breaking the stall by reducing the angle of attack on the wings and pulling out of the dive smoothly and positively without inducing excessive load factors on the wings or tail assembly of the airplane.

Some aircraft will stop spinning if the pilot simply reduces power to

STALL FACTORS

An aircraft stalls when its critical angle of attack for a given airspeed and configuration is exceeded. Note from the diagrams following how the angle of attack may differ from the pitch attitude.

a = Angle of Attack — angle between the relative wind and the wing chord.

b = Pitch attitude — angle between the nose and horizon.

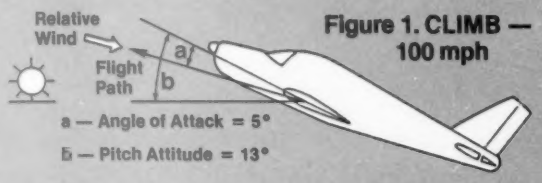


Figure 1. CLIMB — 100 mph

Figure 2. LEVEL FLIGHT — 100 mph

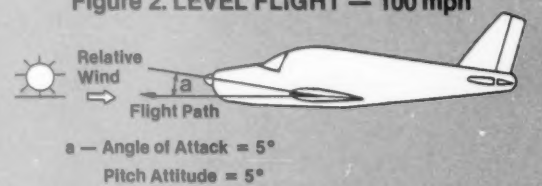
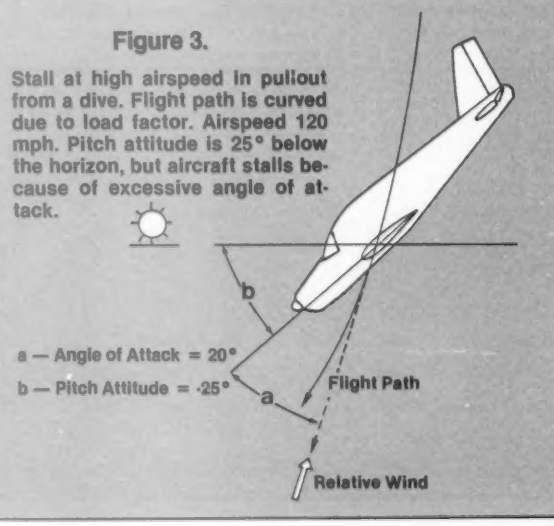


Figure 3.

Stall at high airspeed in pullout from a dive. Flight path is curved due to load factor. Airspeed 120 mph. Pitch attitude is 25° below the horizon, but aircraft stalls because of excessive angle of attack.



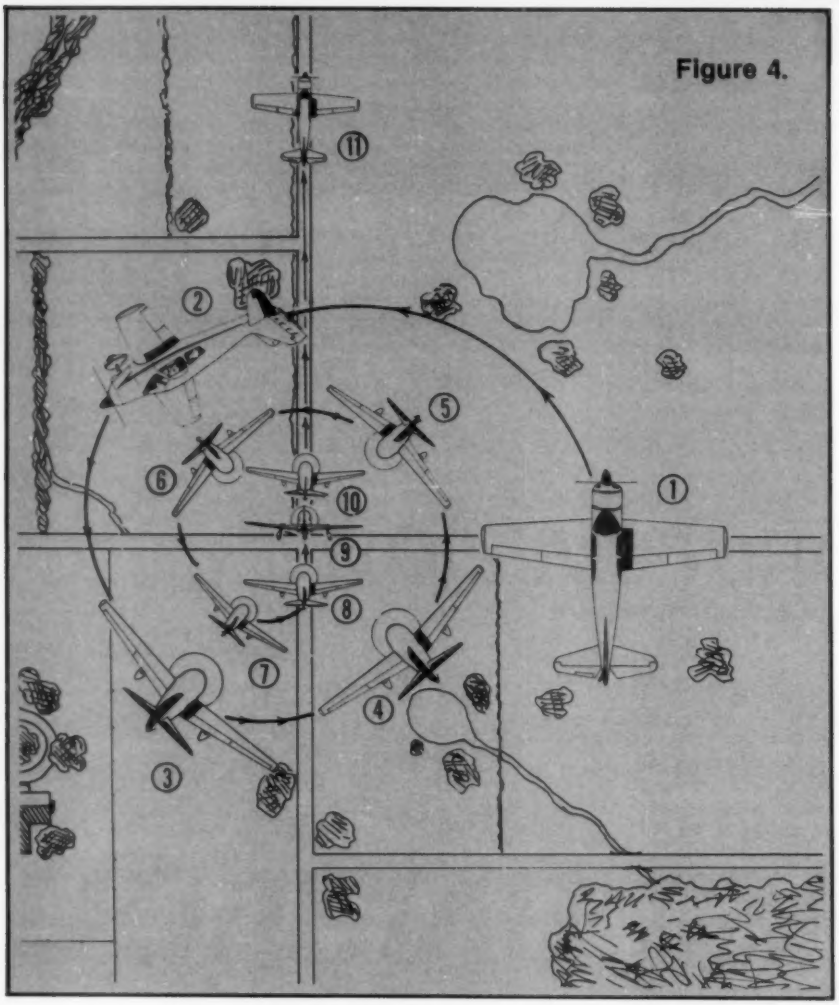
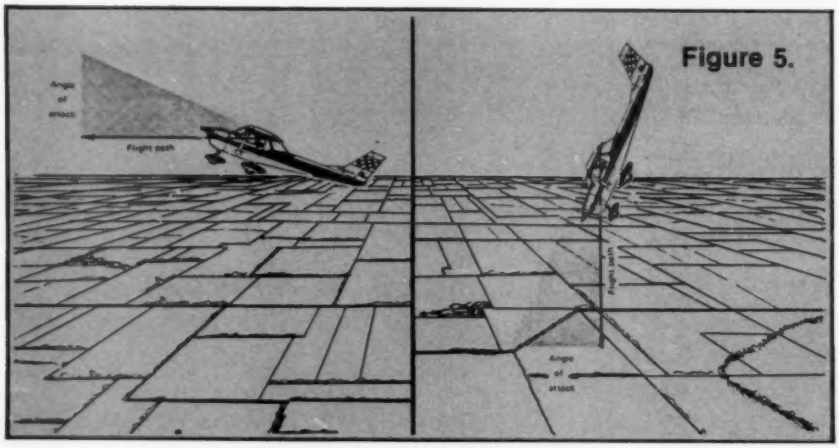


Figure 4. The first two turns of a spin and recovery as seen from above. The apparent tightening of the spin perimeter is due to perspective. (1) The aircraft stalls, with the left wing losing lift earlier. (2) The left wing goes down and autorotation sets in (3) The nose drops and a full spin develops with the rudder deflected left. (4) Vertical speed is increasing, (5) & (6) Note that the path of the airplane is that of a corkscrew rather than a spiral (6) Maximum negative pitch angle is achieved (7) Rudder is moved to right and the right wing descends (8) The rotation has stopped and at this instant the airplane is held in the stall in a wings level/nose down attitude. (9) & (10) The nose is allowed to come up. (11) A smooth pull-out is accomplished.

(NOTE: The editor acknowledges with thanks the assistance of Mr. Sammy Mason, Sr., a veteran test pilot and author of a forthcoming book on spins; and the advice of James Bowman and Jim Patton, spin experts at the Langley Research Center.)

Figures 4 and 5 reprinted by permission from THE FLIGHT INSTRUCTOR'S MANUAL by William K. Kershner 1974 by the Iowa State University Press, Ames, Iowa 50010.



BASIC SPIN RECOVERY

Since no two aircraft models are identical in design, there are some differences in the various manufacturer's recommendations for spin recovery, as provided in the Owner's Handbook. Essentially the technique consists of applying full opposite rudder followed shortly by positive forward stick.

Unusual resistance to recovery may be encountered if the airplane is badly out of trim or improperly loaded. Other causes of recovery failure are unwarranted or wrongful control inputs on the part of the pilot. Remember that opposite rudder means opposite to the direction the airplane is turning—not opposite to the apparent movement of the earth. Refer to the turn needle in the panel instrument. *Disregard the ball*, it will not be reliable.

Commit the manufacturer's instructions for your airplane to memory, and review them frequently. The spinning cockpit is no place to study the handbook.

With some twin engine airplanes, if normal procedures do not result in prompt recovery, power from the engine in the down wing may be used to stop rotation. If the wrong throttle is pulled, of course, the situation will worsen.

***Caution:* The principles outlined above are for general understanding, and are NOT intended as guidelines for self-instruction in spin recovery practice. No one should deliberately spin an aircraft without prior dual instruction.**

idle and takes his hands and feet off the controls. However, unless the pilot promptly resumes control, the airplane may continue in a spiral descent.

A spiral *dive*, incidently, is often confused with a spin, and it is important to be able to distinguish between the two. In a spin the aircraft remains stalled, with little or no aileron response, and a fairly stabilized airspeed and attitude. In a steep spiral the aircraft is not stalled; the bank angle may steepen; and the airspeed may build up excessively in a short time. One clue is in the airspeed indicator; *in a spin it will not read much above stall speed.* Recovery procedures are not alike, and if inappropriately applied could worsen either situation. Subjective impressions are not reliable.

The rudder is the key control surface in spin entry and recovery. The dominant cause of the inadvertent spin is exceeding the critical angle of attack for a given stall speed while executing a turn with excessive or insufficient rudder—an uncoordinated turn. In a sense, the lack of coordination could also be ascribed to insufficient or excessive aileron, but when the airplane approaches stall speed the ailerons may be unresponsive at a stage where the rudder is still fairly effective. The spin normally goes in the direction indicated by the rudder; i.e., holding left rudder will normally give you a rotation to the left, right rudder will normally give you a rotation to the right, regardless of which wing tip is raised.

In a skidding turn (to the left, for example) it seems natural to expect that if a stall and spin develop, the rotation will be with the rudder, since the left aileron and rudder are being held. But in a slip, with opposite aileron held against the rudder, it comes as a surprise to some pilots to find that if a spin develops the wing will usually roll over against the held aileron.

It is also important to remember that in an uncoordinated maneuver such as a slip, pitot/static instruments, notably altimeter and airspeed, are unreliable (because of the uneven distribution of air pressure over the fuselage). Unless the pilot is very attentive to the feel of the controls, he may not realize he has exceeded the critical angle of attack until he hears the stall warning horn, and by that time it may be too late to avoid a stall and possibly a spin.

The slip, incidentally, is a maneuver which historically developed as a means of burning off excessive altitude during an approach to land without turning or going around, in airplanes without wingflaps. Some pilots and instructors now advise against its use at low altitudes, because of the possibility that with insufficient airspeed a stall could result.

The loading factor. Since an aircraft essentially spins around its center of gravity, interior loading affects spin susceptibility and recovery. In general, the farther forward the center of gravity (within allowed limits), the more responsive the rudder will be in controlling rotation. In fact, some aircraft are placarded against spins with passengers in the rear seats, even when such seating does not cause the C.G. envelope to be exceeded. In cases where recovery from a spin is sluggish, moving the occupants as far forward as possible may help. An excessively aft C.G. will increase the likelihood of an unintentional spin and make it more difficult to recover—or perhaps result in a *flat* spin.

In a flat spin the nose comes up to a near-horizontal attitude and resists forward stick pressure. This leads to a very high angle of attack and a rotation which may bring about engine stoppage, as centrifugal force prevents fuel from entering the supply lines from the tank.

Some general aviation aircraft are said to have design features which resist flat spinning, but this resistance could be overcome by mishandling the controls (applying full power, for example) or by misloading; and some designs will not recover from a flat spin. The placarded restrictions on loading must be taken very seriously. In a recent tragic accident in Montana a very experienced pilot and his passenger lost their lives in a flat spin in a tandem two-seater which was marginally overloaded on takeoff.

The aircraft, a *Luscombe* T8F (high-wing monoplane), was a converted aerial applicator with full aerobatic capability. The pilot/owner was a veteran of 11,000 civilian and military flight hours. Apparently he had previously flown the airplane only from the front seat, since it was placarded against solo flight from the rear. But on this occasion he had a passenger up front—slightly lighter than himself in weight. According to National Transportation Safety Board investigators, the center of gravity on takeoff was close to but not beyond the aft limits. The gross weight was about 19 lbs. beyond the limit. The two men departed from the small farming town of Choteau, in north central Montana, on the morning of October 14, 1982, for a local flight in clear VFR weather. There were no recorded radio transmissions. Two hours later a neighboring farmer reported the plane was down in a wheat field with no survivors.

From the evidence at the crash site (there was no fire) the *Luscombe* had impacted the ground at a wings-level, nose-level, flat attitude with little or no forward motion, but in a rapid vertical descent and a left turn rotation. There was no indication of any mechanical failure or pilot incapacitation prior to the crash.

The rear seat pilot's seatbelt was found unbuckled, and his position suggested that he may have been trying to shift the C.G. forward with his body in order to recover from an apparent flat spin.

If you are to remember only one thing about spins, let it be this: **Rudder pressure initiates the spin rotation, and opposite rudder pressure is the primary and initial means of arresting the rotation.** Random control inputs are likely to worsen the situation.

For example, pushing the control wheel forward to break the stall before rotation slows may prolong recovery in some aircraft, because the depressed elevator may blanket the rudder—and possibly lead to an inverted spin. For the non-aerobatic pilot this could be a nightmare. Recovery from an inverted spin is extremely confusing and may be difficult to accomplish.

The length of time required for the rudder to stop the rotation will depend in part on the angle of attack, and on the design of the tail assembly—especially the degree to which elevator movement permits blanketing of the rudder during the near-vertical movement of the air. No matter how close the ground appears, the pilot must resist panic impulses to pull back on the wheel before both the rotation and stall have been overcome. Care must be taken as soon as rotation stops to neutralize the rudder, in order to prevent a possible spin in the opposite direction.

Once the rotation has stopped, the control wheel must be moved forward without hesitation. If the ground is already close and the nose-down attitude is already very steep, this may be difficult to accept, but the pilot really has no other option. Unless the angle of attack is reduced immediately the airplane may remain stalled and spin again in the opposite direction—with possibly no chance of recovery in time. The pilot must trade off *altitude for control*. If an impact with the ground is inevitable, the less control a pilot has, the poorer his chances for survival.

Specialized pilot training (in appropriate aircraft with spin-qualified instructors) can give one a better preparation for dealing with unintentional spins than study alone, and simulator training is also helpful. However, unintentional spin *avoidance* is still the goal. The spin characteristics of a training plane may be very different from those of a normal category airplane. Furthermore, the same airplane that recovered easily from a spin under one set of circumstances may resist recovery very strongly under other conditions. A slight modification of the airfoil (from icing, for example, or dried mud), a small change in the configuration or loading—even an uncalculated change in density altitude could affect recovery time markedly.

The only known method thus far for completely eliminating airplane spin tendencies is to interconnect the rudder and ailerons on the control column and remove the rudder pedals. This prevents uncoordinated turns or slips. Also, elevator travel is limited, to prevent stalls when the airplane is loaded within design limits. These control limitations have not been generally acceptable to pilots.

Current research at NASA's Langley (VA) Test Center is seeking to increase spin resistance. This may enable a pilot to recover from a stall, despite uncoordinated controls, before a full-fledged spin develops. Meanwhile, maintaining a high level of stall and spin awareness is the best means of preventing stable airplanes from turning into whirling dervishes. ■

CALCULATING THE SLOPE

The role of surface conditions in determining minimum takeoff distance for unpaved runways

Operating at back country airports is sometimes a problem for city-based pilots, not for lack of technique as much as for lack of knowledge about an aircraft's limitations. If you base a light airplane at a large airport, with runways made up of something like two miles of pavement, then you are not likely to be in the habit of making preflight calculations about minimum takeoff distance, or weight limitations. But when you have occasion to fly in and out of an unpaved strip in the hills or mountains, perhaps for a vacation or a visit to country cousins, you may have to do some close calculating down to the last pound of weight and foot of cleared space—or risk learning about your machine's performance data the hard way.

Performance charts and tables are provided in the Pilot's Operating Handbook, including data for takeoff and landing for given weights and elevations. These deserve a close scrutiny during flight planning, including any notes in small print underneath the chart. You also want to be reasonably sharp on your short-field takeoff procedures, since the charts are usually based on the assumption that the pilot will use optimal control and power settings when the distance is restricted—i.e., short-field takeoffs and landings.

For example, consider a takeoff accident which involved the pilot of a Cessna 172R (retractable) *Skyhawk* based at Lakeview County Airport, in southcentral Oregon. Lakeview is not quite in the category of LAX, as regards real estate, but it does have a paved 5,200′ runway and no surrounding obstacles in the immediate vicinity, except for flocks of waterfowl in the spring. On March 7, 1982, a mild, clear day, the pilot and two passengers embarked on a flight into the rugged, mountainous country to the north. Their itinerary included a stop at Plush, a tiny settlement at the base of the Hart Mountain Wildlife Refuge, which had a private strip, unpaved, about 2,500′ in length. After an hour's visit, they departed at 11:30 a.m.

A quick glance at the takeoff data for the 172R might suggest no difficulty with the existing conditions. The field elevation was listed as 4,800′ and with the noon temperature close to standard (41° F) the density altitude was about 5,000′. With maximum gross weight and a calm wind, the required ground run was 1,255′ (See Fig. 1).

Room to spare, right? Well, the *Skyhawk* did not quite make it. The pilot reported later, according to National Transportation Safety Board investigators, that after liftoff the airplane settled back down on soft ground. By the time he got airborne again he was not quite able to clear the top wire of the bordering fence with his gear, and flipped over on the other side. By good fortune there was no fire and no one was badly hurt. *What happened to all of the runway?*

Ground run is not the whole story. Virtually all back country strips have some kind of terrain obstacles nearby—fences, trees, hillsides, etc. The strip at Plush was surrounded with a chainlink deer fence, approximately ten feet high. The *Skyhawk* Handbook data indicates that while the required *ground run* is 1,255′, to clear a 50′ obstacle at density altitude of 5,000′ a total travel distance of 2,480′ is needed—virtually double the ground run. Admittedly 50′, is considerably higher than 10′, but still you would have to allow about 600′ for the airplane to pick up airspeed and rise out of ground effect high enough to clear the fence comfortably.

Still room to spare . . . except that you would also, have to add more takeoff distance because the strip is *unpaved*. In small print under each table for takeoff distance the

PERFORMANCE DATA FOR CESSNA 172M *SKYHAWK*

TAKE-OFF DISTANCE FROM HARD SURFACE RUNWAY WITH FLAPS UP
(from Cessna handbook)

Gross Weight Pounds	IAS At 50′ MPH	Head Wind Knots	At Sea Level & 59°F		At 2500 Ft. & 50°F		At 5000 Ft. & 41°F		At 7500 Ft. & 32°F	
			Ground Run	Total To Clear 50 Ft Obs	Ground Run	Total To Clear 50 Ft Obs	Ground Run	Total To Clear 50 Ft Obs	Ground Run	Total To Clear 50 Ft Obs
2300	68	0	865	1525	1040	1910	1255	2480	1565	3855
		10	615	1170	750	1485	920	1955	1160	3110
		20	405	850	505	1100	630	1480	810	2425
2000	63	0	630	1095	755	1325	905	1625	1120	2155
		10	435	820	530	1005	645	1250	810	1685
		20	275	580	340	720	425	910	595	1255
1700	58	0	435	780	520	920	625	1095	765	1370
		10	290	570	355	680	430	820	535	1040
		20	175	385	215	470	270	575	345	745

NOTES: 1. Increase distance 10% for each 25°F above standard temperature for particular altitude.
2. For operation on a dry, grass runway, increase distances (both "ground run" and "total to clear 50 ft. obstacle") by 7% of the "total to clear 50 ft obstacle" figure.

Cessna Handbook recommends increasing the total takeoff distance by seven percent if the surface is short, dry grass, rather than hand surface. If the grass is wet and the turf is soggy, as it is apt to be in March at this particular location in Oregon, a 15 or 20% increase might be in order. Now the total distance needed to clear is getting uncomfortably close to what is available. If you get even a slight wind shear on liftoff (very possible, considering the mountains around Plush), or if your engine rpm is not up to optimum, or if you are a little sloppy with the power control or flaps, you too might not make it.

Some pilots have little patience with the performance data provided by the manufacturer. They prefer to rely on simply "eyeballing" a runway and comparing it mentally with their usual takeoff or landing experience. Detailed graphs, in particular, can be puzzling to persons not skilled in using this kind of information. And in fact there are opportunities for error when the calculation is made in haste, or by unpracticed persons.

Airplane manufacturers, aware of this problem, have been giving more space in recent years to fairly simple tables for basic information in their Operating Handbooks. Now it is possible to find uncomplicated tables for takeoff and landing data, as well as for rate and angle of climb and even for power-off glide. Distance required for takeoff or landing, under a variety of conditions, can be read off easily by placing a straight-edge across the appropriate table.

In addition to the fixed data, Cessna's Handbook recommends that you increase the takeoff distance 10 percent for each 25° F. above standard temperature at any altitude. Alternately, if your actual data lies well between the figures given in a table, interpolating from tabular figures is a simple mathematical exercise (See Fig. I.).

The effect of varying surface, wind, and slope conditions on the required takeoff distance for a 172M Skyhawk, *according to the Australian performance charts. All takeoffs are plotted for 5,000′ density altitude at maximum gross weight of 2204 lbs. Note that a five knot tailwind adds more to the required takeoff distance than a ten knot headwind subtracts.*

Situation	Takeoff Roll	Wind	Runway Slope	Runway Surface
1	2950′	calm	level	short dry grass
2	3610′	calm	level	short wet or long dry grass
3	5580′	calm	level	long wet grass
4	3450′	5K(tail)	level	short dry grass
5	2790′	5K(head)	level	short dry grass
6	2540′	10K(head)	level	short dry grass
7	2630′	calm	−1%	short dry grass
8	3280′	calm	1%	short dry grass
9	3770′	calm	2%	short dry grass

By working out your computations in advance, you get a pretty good idea of how feasible any remotely situated airstrip will be for your airplane (and your skill level) before you set out on a flight—let alone before you commit yourself to a landing on turf from which you may have to be airlifted by helicopter if anything goes wrong. However, there are some details about back country airports which are not normally published on sectional charts or in airport directories, and which can be very important to your survival. One of these is *slope gradient.*

FAA airport design standards allow up to a two percent longitudinal slope for utility airports. However, at unsurfaced runways in the mountains or in secluded valleys the runway gradient may range as high as three to four percent from horizontal. That much of a grade is more than most general aviation aircraft can handle and still achieve liftoff speed within the available distance—if indeed they could achieve it on that grade even with unlimited distance.

The standard rule for sloping runways is, *take off downhill and land uphill.* There are enough problems associated with unfamiliar back country airports without adding the pull of gravity to the list. If there is an adverse wind, try to wait until it subsides.

The direction of slope, if any, is something you can never discern safely with the naked eye. The adjacent terrain can be very deceptive. A logging road in the background for example, that rises sharply to the right could give you the impression that the strip you will be operating on is level or slopes up toward the left, when in fact it too rises toward the right. This kind of confusion can have fatal results, as it did during an attempted takeoff from McKenzie Bridge Airport—also in the central Oregon mountains.

The airport is located in a valley of the Willamette National Forest at an elevation of 1,640′, surrounded by mile-high mountains. On the morning of July 24, 1982, a Beech

Long, wet grass can easily add 50 percent to the required takeoff distance.

Bonanza S-35 landed on the strip for a brief stay and departed shortly after noon with a pilot and one passenger on board. The pilot, who had logged about 500 total hours, was part owner of the airplane and had been checked out thoroughly in it.

The takeoff was witnessed by several persons on the ground who reported later to the National Transportation Safety Board that the airplane ". . . started off at the bottom of the hill going up. . . ." (to the east). They saw the plane lift off very late and rise to an altitude of about 20′ before striking trees and going down. Both occupants died in the crash and fire.

Safety Board investigators found no evidence of mechanical failure or pilot incapacitation that might have contributed to the accident. A careful compilation of all the factors that affect takeoff distance, in accordance with the Pilot's Operating Handbook, showed that the available runway was just about the required distance to clear a 50′ obstacle, despite the presence of an estimated 15 knot tailwind.

However, there are several factors which are not considered in U.S. handbooks—notably upgrade slope (perhaps because no one is supposed to take off uphill). In some other countries, like Australia where a great deal of flying is done routinely in the remote "outback", performance charts are required to provide for a slope gradient calculation up to two percent grade, plus or minus. For light aircraft, the increase in the total takeoff distance ranges from 10 to 25 percent for each percent of upslope. The Safety Board reported the rise at McKenzie Bridge Airport to be 3.4 percent.

The slope grade is not shown on U.S. sectional charts, nor is it usually shown in airport directories, although pilot warnings may be given, as they were for McKenzie Bridge. Pilots have the responsibility for acquiring all pertinent runway information—if necessary by contacting the owner of the airport, or by consulting with pilots familiar with it. In unusual cases where no help is available you can check it out for yourself after landing, by moving your airplane from one end of the runway to the other and taking altimeter readings. Most sensitive altimeters will show differences down to 20′. To find the gradient you divide the runway length into the elevation difference. Thus a 50′ rise on a 2,500′ runway indicates a 2 percent slope.

If the runway is too short or the grade too slight to show up on the altimeter, you can look for natural indicators, such as the direction of flow of a nearby stream. Or you can taxi your airplane in both directions at the same rpm and note any major change in airspeed. The shorter the runway, the more important it is that you know which way is up. If the answer seems to be a toss-up, be guided by wind direction and enclosing terrain.

Taxiing over the runway will give you an opportunity to observe the surface conditions, which can vary tremendously. Most U.S. pilot handbooks give you an add-on figure for short dry grass, but the Australian P charts also give you specific calculations for *wet* grass and *long, wet grass*—the latter may require a considerably longer additional ground run than solid dry turf. There are no figures available for sticky mud or wet snow patches; only the need for good judgment. The Australian charts, incidentally, crank in an overall addition of 15 percent to the required takeoff distance, to provide for any unobserved or unforeseen disadvantages. Not a bad idea, when you're really out there in the wild. Nobody's perfect, right?

At least not all the time. ■

INTERPOLATION REVIEW

The following example is for a light twin, you are planning to take off from a pressure altitude of 3,000′, with a 10 knot headwind and an air temperature of 65°F. In the table the temperature is given in 25° increments. Thus there is no column for 65°. You must create one.

To do so, you start with the nearest *lower* column figure, which is 50 degrees; this serves as a base line. Next you take the interval between the base line and the next column in sequence (75 degrees). The interval is 25 degrees. The interval between the base line and the required *new* column of 65 degrees is 15 degrees. Thus, the imaginary column will be 15/25ths of the interval between 50 and 75 degrees; this reduces to 3/5ths or 60 percent. That is the essence of any interpolation—finding a percentage of the difference between two listed values.

The remaining steps are:

1. Run a line, drawn or imaginary, across the table from the 10 mph wind velocity to intersect the 50 and 75 degree columns.
2. Compute the difference in runway distance for 50 and 75 degrees. It works out to 212 feet.
3. Sixty percent of the difference is 127.2 feet. Add it to the 2030 base line figure and you come up with a final answer of 2157.2 feet take-off distance.

TAKE OFF DISTANCES (OVER 50′ OBSTACLE) GROSS WEIGHT 8,000 LBS.

Pressure Altitude Feet	Wind Velocity MPH	Outside Air Temperature °F			
		0°	25°	50°	75°
3,000	−10	2,282	2,535	2,808	3,098
	0	1,955	2,172	2,406	2,656
	+10	1,648	1,832	2,030	2,242
	+20	1,364	1,517	1,684	1,860

What the horse and cowboy were to the old west, the airplane and the bush pilot were to Alaska in the early decades of the 20th century, when the Gold Rush had subsided and transportation was the great obstacle to settling the territory and fulfilling its dreams of statehood. Enormous stretches of woodland and tundra and water separated the early settlements, and the airplane—even without radio, or NAVAIDS or sophisticated instruments—was often the only means of supplying food and medical aid to isolated Alaskans. In time the hardy bush pilots also played a major role in the economic resurgence, linking together hundreds of small communities and bringing in tourists, scientists and sportsmen.

One such pilot who found his particular challenge in the snowy slopes of the highest mountain in North America (Mt. McKinley, 20,320 feet) was Don Sheldon. Born in the Colorado Mountains in 1921 and raised on a cattle ranch in Wyoming, Sheldon was orphaned at an early age. Graduating from high school in 1938 the lanky youth and two friends moved on to the last American stronghold of adventure—Alaska.

Their meager funds took them as far as Seattle, from which Sheldon went on alone by steamer, in steerage, to Anchorage, and eventually to a small settlement at the foot of Mt. McKinley, called Talkeetna.

Talkeetna consisted of one dirt street lined with wooden sidewalls and buildings, mostly saloons and supply stores for the miners and trappers who spent most of the year grubbing for a living digging in the gravelly slopes or tramping along the densely wooded stream banks.

In 1939 dogsleds and snowshoes were still the common transportation between Talkeetna and the vast McKinley slopes. For the best part of three years Don Sheldon labored in the mines and with the trapline, and in the timber camps. Like most of his companions he remained poor and weary.

The occasional bush plane flying over his traplines gave him the idea that all of the gold in Alaska was not in the ground, and he saved up enough money to take flying lessons at Lar Larsons esteemed flight school in Anchorage.

With the outlook of World War II Don joined the Army Air Corps. Instead of becoming a fighter pilot as he had hoped, he was relegated to tail gunner in a B-17. After two years of combat in Europe he was discharged with five medals (including the Distinguished Flying Cross). He had learned his lesson from the perenially impoverished miners (who generally blew their earnings in the "pleasure palaces" in town) and managed to save most of his pay. He bought an airplane and flew home—which was still Talkeetna.

Starting with one worn Taylor *Cub*, whose tattered wings he had patched with burlap en route to Alaska, Sheldon founded the Talkeetna Air Service in 1950, with an "Anywhere you're willing to go I'll fly" attitude that grew into a legendary reputation. As a pilot he was an unusual combination of perfectionist and daredevil. He was fanatic about top quality maintenance in every detail, and would never fuel an airplane without straining the gas through chamois four or five times.

Yet he would set a plane down on meager patches of snow on mountain icefields regarded as death traps by other bush pilots. But here too he left nothing to chance, seeking out every bit of assistance from the terrain, the weather and the airplane. Although he would fly anywhere in Alaska, he regarded the huge glaciers, bottomless crevasses and perpendicular rock faces of Mt. McKinley as a personal challenge, as well as his chief source of livelihood.

Teaming up with the reknown McKinley mountaineer and scientist Bradford Washburn, Sheldon completed hundreds of seemingly impossible landings on the upper slopes for survey and exploratory missions. The demand for his services as a ferry pilot for mountain climbers and high altitude hunters grew, along with his fame as a rescue pilot. In plucking injured or lost climbers from snow or ice covered slopes Sheldon became a master of the "reverse Christie" technique of landing uphill on a glacier and whipping the airplane around sideways to the slope (to keep it from sliding back down).

Sheldon's reputation spread beyond the Alaskan borders in 1955, following his rescue of a team of Army engineers who had attempted to chart the course of the Susitna River, near the base of McKinley. Checking up on their progress during a flight in the area, Don spotted boat wreckage and supplies in the river just below the "Devil's Canyon," over 600 feet wide at the top but with rock walls only about 100 feet at the base, where boiling waters raced through a rocky gorge.

Peering through the spray Sheldon located the surveyors clinging to a narrow, slippery ledge, and signalled that he would descend. Landing in the rapids was out of the question, as his pontoons would be smashed open on the rocks. Instead he flew upstream and landed on a section of quiet water, and then drifted *backwards* downstream, controlling the airplane with rudder and prop blast and maneuvering close enough to the ledge for two of the survivors to clamber onto his pontoons. He backed down out of the canyon, took off and flew the men to safety, then returned for three more incredibly perilous passages backwards through the rapids and rescued the entire party of eight.

In a career total of over a million air miles Don Sheldon smashed up half a dozen airplanes but never lost a passenger or turned down a rescue appeal. He married Roberta Reeve, the daughter of Alaska's great pioneer bush pilot, Bob Reeve. Their Air Service expanded over the years, but it was always an economic struggle with long hours and little pay.

Still there was always the satisfaction of knowing that their efforts had helped turn a formidable obstacle of nature into an adventuresome landmark of the 49th state.

Sheldon died of illness in 1975.

ROTATING ROTORS. The propeller shafts of the Airship 500 can be rotated 90 degrees to improve takeoff and landing profiles as well as overall maneuverability of the 164' non-rigid British built "blimp." Constructed with spaceage lightweight materials, and designed with a 48 hour endurance capability, the airship is being considered for law enforcement surveillance along ocean coastal areas. Photos taken at the annual fly-in at College Park, MD.

FAA REVIEWING ULTRALIGHT TWO-YEAR RECORD

The question of whether any additional rulemaking for ultralights is desirable or necessary was discussed in a series of four public meetings held in varying locations across the nation by FAA in late September. Many industry representatives and individuals who participated felt that while the level of safety in ultralight flying was improving, greater emphasis should be placed on operational and maintenance proficiency.

Two years ago FAA enacted Federal Aviation Regulation Part 103, which recognized and defined ultralights as a kind of recreational vehicle and excepted them from airworthiness or performance standards. The ultralight industry was encouraged to assume responsibility for airworthiness and operational safety, as well as for awareness of the airspace restrictions for Part 103 vehicles.

At the recent meetings questions were raised concerning the effectiveness of Part 103 and self-policing in the ultralight community; and the possible need for additional Federal standards.

A decision on the regulatory needs of ultralights will be based on material submitted at the meetings and on comments forwarded directly to FAA, 800 Independence Ave., S.W., Washington, D.C. 20591, Attention Rules Docket No. 24154, AGC-204. Please send duplicates.

LATEST AIRMAN PUBLICATION

Technical Reports

New scientific and technical aviation-related reports published by FAA include such subjects as airport safety, air traffic control automation, communications, environment and weather. A complete list of reports and prices may be obtained from FAA's Office of Public Affairs, APA-300, Washington, D.C. 20591.

RESTRICTED CATEGORY AIRCRAFT

FAA has broadened the authority of field offices to certificate aircraft for special purpose "aerial surveying" operations under FAR Part 21.25. Maritime surveillance, geophysical survey, atmospheric research, airborne surveillance, and airborne measurement of navigation signals in the airspace are some of the flight activities now eligible.

Part 21, enacted in 1950, lists only photography, mapping and oil and mineral exploration as examples of aerial surveying. FAA's Aircraft Manufacturing Division has determined that a number of recently developed uses of aircraft may lie within the intent of the rule, although not specifically identified.

Certification for these special purpose operations is to be considered if the intended operation: (1) Requires special equipment that would rule out eligibility for a standard airworthiness certificate, (2) Would normally be conducted over open terrain or water, and not over densely populated areas, and (3) Be conducted within the limitations of restricted category aircraft as provided in Part 91.39.

TOP INSTRUCTOR, MECHANIC AWARDED NATIONAL HONORS

"Do the best job you can do and never become complacent" is the advice of **James Byrnes,** the 1984 Flight Instructor of the Year Award winner, on the subject of longevity and flying. He also believes in teaching students a full 180° scan, enough to read the insignia on the tail. He should know, as he has logged over 10,800 hours of accident free flight instruction in his 49 years of flying (28 as an instructor).

As a 16-year-old youth in New Orleans he received his first flight lesson, and he has been flying ever since. His career includes a World War II stint as a pilot in the Army Air Corps' Western Training Command, and 26 years with McDonnell-Douglas as a test pilot. In 1956 he began instructing as a sideline and after his retirement he became a Designated Pilot Examiner for FAA. He has issued over 1,100 pilot certificates in the past 10 years.

Byrnes has given freely of his time, as an FAA Accident Prevention Program Safety Counselor, and as a speaker at the Super Safety clinic held yearly at McDonnell-Douglas. He has donated his services and his Cherokee *Warrior* on searches for missing aircraft.

Byrnes and Nelson (see below) will be given their awards by FAA in Washington, D.C. on October 17. They will be hosted for three days by the general aviation industry, and are expected to receive several thousand dollars in cash and prizes.

Charles Nelson is carrying on a 61-year-old love affair with aviation maintenance. Although he started flying in 1927, and is still current, he admits to being a mechanic at heart. "A mechanic who is all heart," is the way he has been described by fellow airmen, whose recommendations led to his selection as the 1984 Maintenance Technician of the Year.

Nelson's aviation career began in 1923 when as an eager 15-year-old he helped build an airplane around a surplus engine. The end result looked somewhat like a *Standard* and flew a number of years. But even more exciting was his role, at age 19, as a maintenance helper on Lindbergh's plane during the celebrated night-long vigil before the first solo trans-Atlantic flight.

Since that time he has held a variety of jobs in aviation, including pilot, flight instructor, A & P technician, aircraft salesman and general operations manager. Currently he is chief mechanic for Midcoast Aviation in St. Louis.

On his own time and expense he is also a "go-anywhere, fix-anything" volunteer for several missionary/medical organizations with stations throughout Latin America and Africa. He has an admirable reputation for being able to repair aircraft in remote areas where spare parts are few and improvisation is the key word.

How does he find the time? He likes to keep busy.

• Sharing the Fare

Regarding the FAR that allows the "sharing" of "actual expenses" of a flight that is piloted by a non-commercially-rated private pilot, and which prohibits the "charging" of the passengers for the flight, how does this FAR apply to flight in a rented aircraft? Specifically, if the pilot is flying at the sole request of the passengers (making a flight that otherwise would not have made), can the passengers be asked to absorb the entire cost of the rental, including fuel and prorated renter's insurance?

Name withheld

The type of operation you describe would be an air taxi flight, which legally could only be provided by the holder of an FAA air taxi certificate.

• PIC Time Revisited

As a flight instructor I have tried to get a straight answer to this question, but only received contrary opinions from flight examiners and your publication. Perhaps you can set to rest this matter of logging dual time after a pilot is certificated for the flight involved.

For instance, say I am giving instruction to a private pilot seeking a commercial certificate. The private pilot is in the left seat as the sole manipulator of the controls and is current and rated in the aircraft. If he logs the flight time as both dual and PIC time, which he is permitted to do, the sum of dual and PIC time on the certificate application could exceed the pilot's total time in his logbook. Would this not be misrepresentation and illegal?

Kurt Meyers
Flagstaff, AZ

Under the conditions described, a private pilot may log a period of flight time as both dual and PIC time. However, for purposes of certification or qualification, the total time logged for any given flight may not exceed the time shown in the "Duration of Flight" column in the pilot's logbook.

• Halon 1211 Hazards

I noted the picture and caption on page 14 of your May June 1984 issue concerning Halon 1211 fire extinguishers. Although the fire supressant qualities of Halon 1211 are hard to surpass, there are certain associated hazards which should be made known to the prospective user. These hazards include debilitating physiological effects (nausea, dizziness, disorientation, etc.) especially when used in confined spaces (e.g. cockpit of an airplane) and exposed to decomposed and undecomposed Halon 1211.

I have enclosed a copy of a report I happened upon while investigating the use of Halon extinguishers for our flightline. You may wish to do some research of your own.

Keep up the fine work with your magazine.

Lt. Glenn R. Gunn
Houston, TX

Thanks for providing us with the additional information.

• Safety Pilot Qualified

Isn't something missing from your answer in the January/February Forum letter, "Unsafe Safety Pilot?"

Name withheld

That is correct. Unfortunately part of the statement was omitted. It should have read, "A safety pilot must be current and qualified for the aircraft in order to act as PIC."

• TCA and the Student Pilot

I enjoy your magazine very much, but I would like to bring to your attention an error in the May/June issue.

On page 7, you state that "in order to operate in a Group I TCA, at least a private pilot certificate is required." This is only true if operating to/from the primary airport; otherwise a student pilot can legally operate in the TCA.

Bob Simmons
Cortaro, AZ

Possibly, we should have been more specific as to what we meant by "operate." FAR Part 91.90(a)(2) provides that the pilot in command of a civil aircraft must hold at least a private pilot certificate to take off or land at an airport *within* a Group I TCA. Therefore, a student pilot may, with appropriate clearance, transit a Group I TCA airspace so long as he/she does not takeoff or land the aircraft *within* that Group I TCA.

• Photography for Two

I am planning to do some aerial photography and was wondering what the regulations were for doing it in a two-place ultralight?

John Ballinger
Las Vegas, NV

According to Federal Aviation Regulation Part 103, an ultralight may only be operated for sport and recreational purposes, and aerial photography does not fall into either category. Further, the rule limits the vehicle to a single occupant. To qualify for a two-place operation an ultralight operator must obtain an exemption to conduct approved flight training only. (As an alternate solution, the craft would be registered as an amateurbuilt aircraft. However, with this you must comply with all regulations that apply to aircraft including airworthiness pilot certification, operating rules, and maintenance requirements).

• VASI Realignment

The May/June 1984 issue has an article on "Landing Signals" which makes some statements I question: "Airplanes . . . are required by regulation to maintain an altitude at or above the glide slope until a lower altitude is necessary for a safe landing." True, but that FAR [91.87(d)(3)] only applies to operations at an airport with an operating control tower.

Also, "VASI's are often used in conjunction with instrument landing systems . . ." Would it not be more correct to say that the FAA has installed numerous VASI systems on nonprecision *instrument runways as a visual aid because of* lack *of vertical descent guidance. Few precision instrument approach runways have VASI unless they were already there when the ILS was put in.*

Finally, "The visual range (of VASI) is from three to five miles by day and up to 20 miles at night." Chapter 2 of the AIM points out. "The visual glide path of the VASI provides safe obstruction clearance within plus or minus 10 degrees of the extended runway centerline and to four NM from the runway threshold. *Descent, using the VASI, should not be initiated until the aircraft is visually aligned with the runway." The same comment applies to PLASI; it should not be called "usable" out to 10 miles.*

Bob Hutchins
Albuquerque, NM

Points well taken.

FAA GENERAL AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFO-807, Washington, D.C. 20591.

• "Club" vs FBO

I have been wondering whether there are any safety considerations that should concern members of a flying club which is in fact owned by private individuals, who rent or lease out some of the club aircraft regularly.

Ed Rice
Herndon, VA

Aircraft which are rented or leased by a flying club to individuals for flight instruction, must undergo 100 hours inspection in addition to other inspections required for all aircraft.

INSTRUMENT CORNER

• CZ Questions

I have some questions about control zones that have caused us some confusion. For example, suppose the official weather observer in a control tower reports a ceiling of less than 1000 feet for his control zone. But this ceiling does not extend over an uncontrolled airport within the boundary of that control zone. Can a pilot on a special VFR departure from the tower-controlled airport cancel the special before he is out of the control zone, when he is in VFR conditions? And can he then land at an uncontrolled airport, which is VFR, in the control zone which is officially IFR, without a clearance? On the other hand, if a ceiling exists at the uncontrolled airport of less than 1000 feet but the control zone is VFR elsewhere, can a pilot legally land at the tower-controlled airport under VFR flight rules?

Edwin C. Colbern, M.D.
Oxnard, CA

A pilot with a special VFR clearance simply advises ATC when he/she can maintain flight under VFR conditions. The pilot must continue to comply with the ATC clearance until leaving the control zone or until released by ATC. ATC will normally release an aircraft to continue VFR via its planned flight when other traffic in the zone is not a factor.

In answer to your last question, it is important to understand that the term "ceiling" in a control zone applies only when that ceiling is reported in an official weather observation at the airport for which that control zone is designated. If the reported ceiling is less than 1,000 feet, VFR operations are *not* permitted anywhere in the control zone (except for Special VFR, when authorized). In the absence of an official weather observation pilots may operate in the control zone without authorization as long as the entire operation can be conducted under the weather minimums for VFR flight in controlled airspace.

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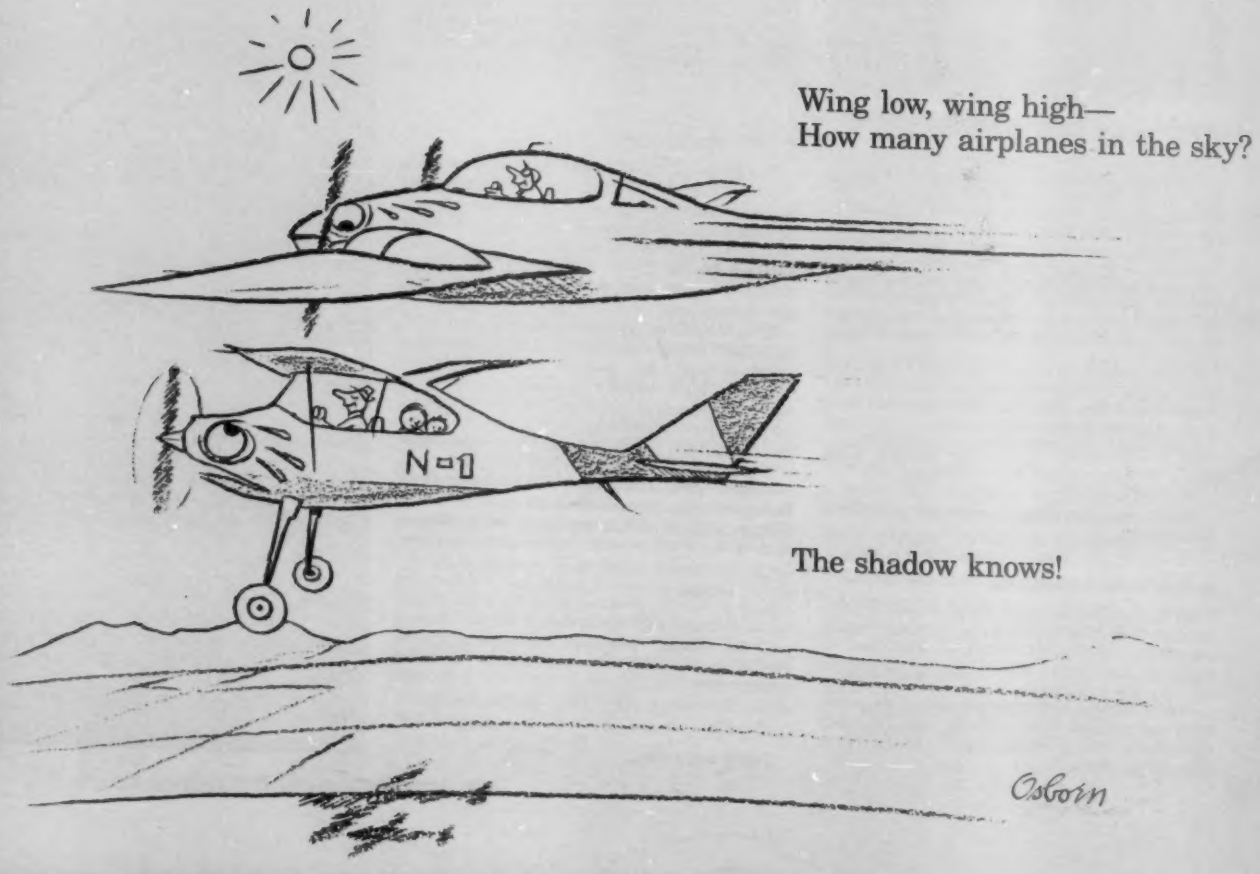
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